Supporting Change in Farming Systems Res arch

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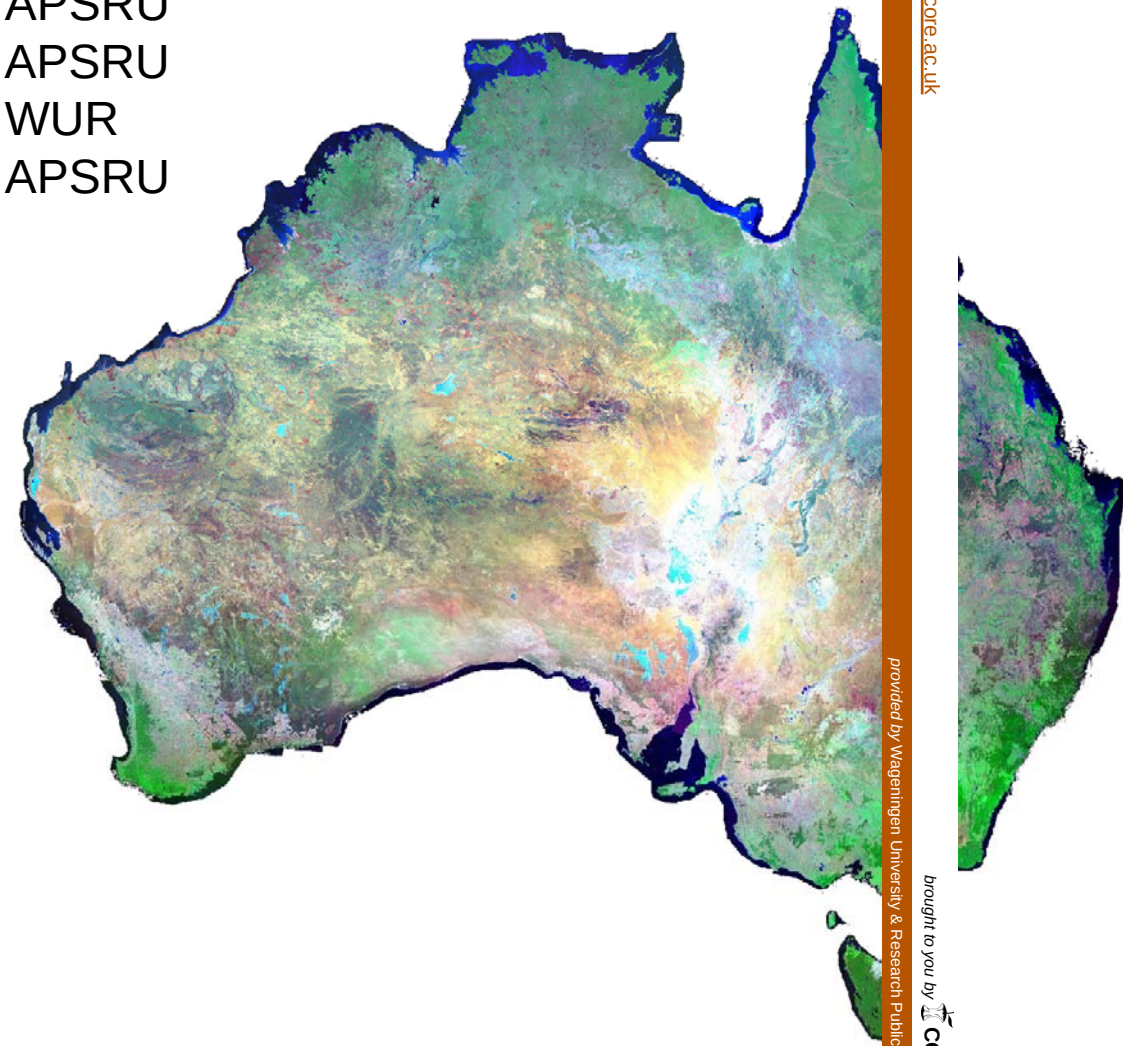
AGRO2010, Montpellier.



Supporting Change in Farming Systems Research

- Apsim & farm scale management
- Component based design
- Samples of WFM applications
- Informed Change

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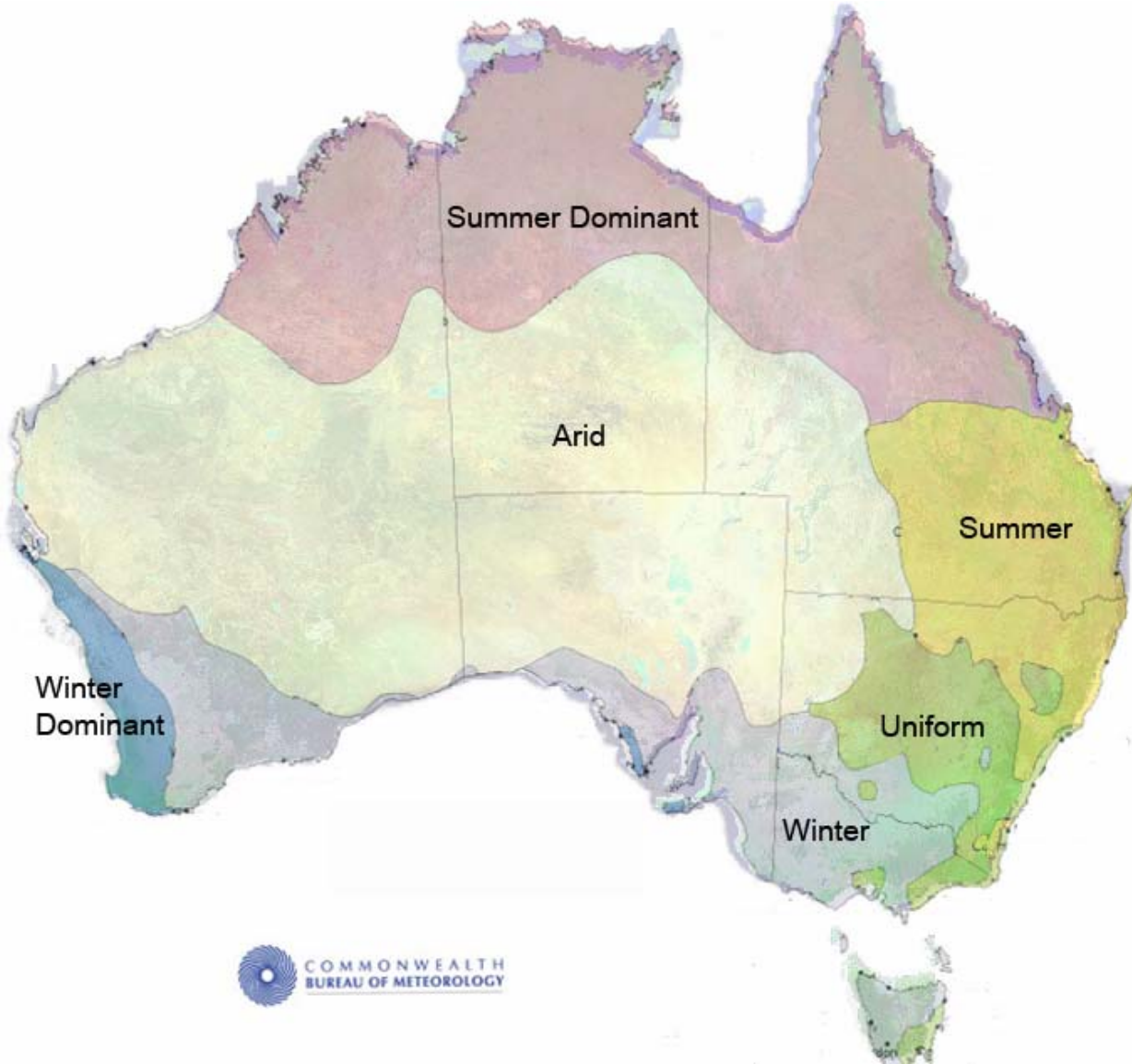

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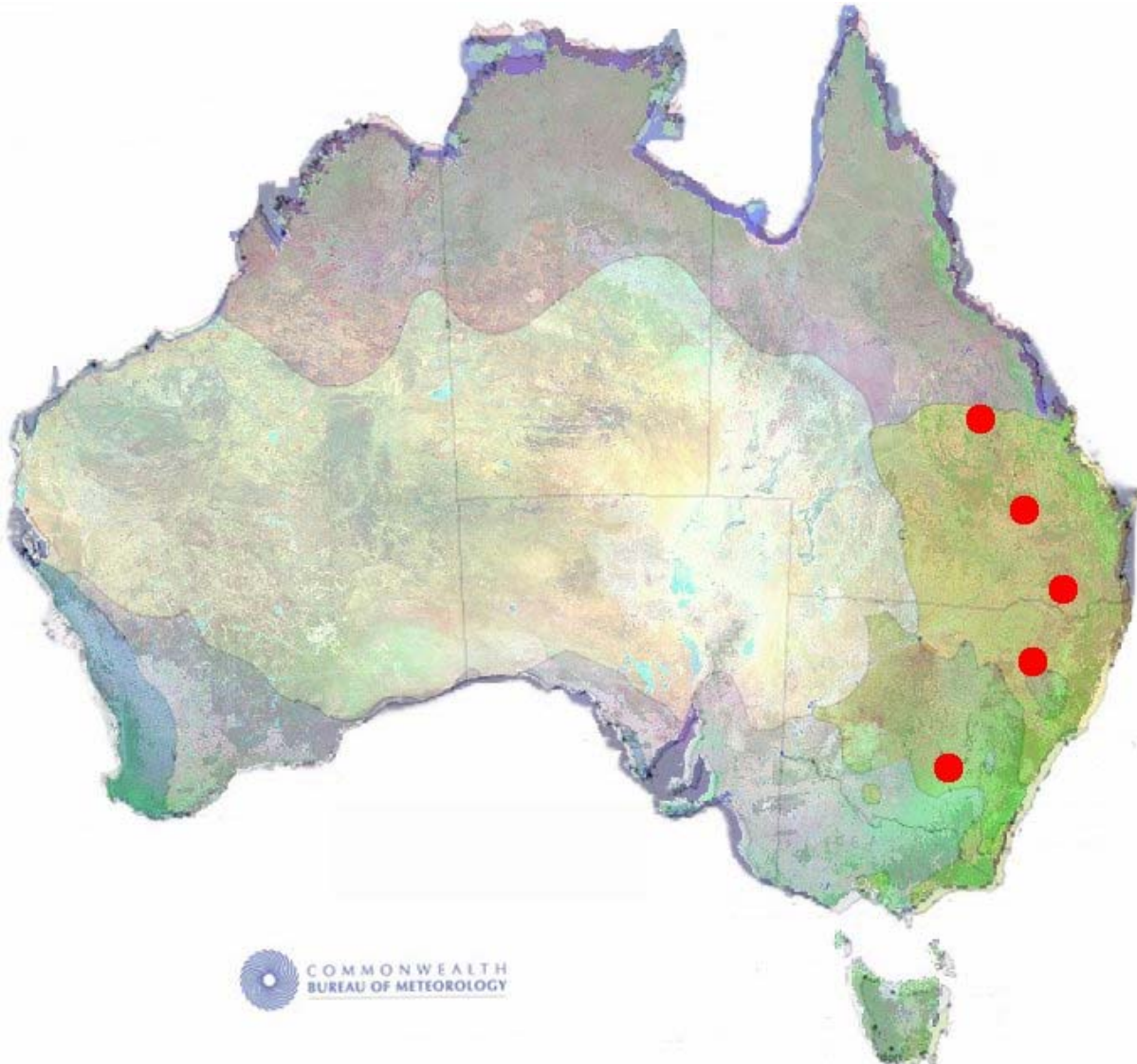
Case studies:

Long growing season(s),
High rainfall variability

Irrigation
Broadacre Dryland
Mixed Grain & Grazing



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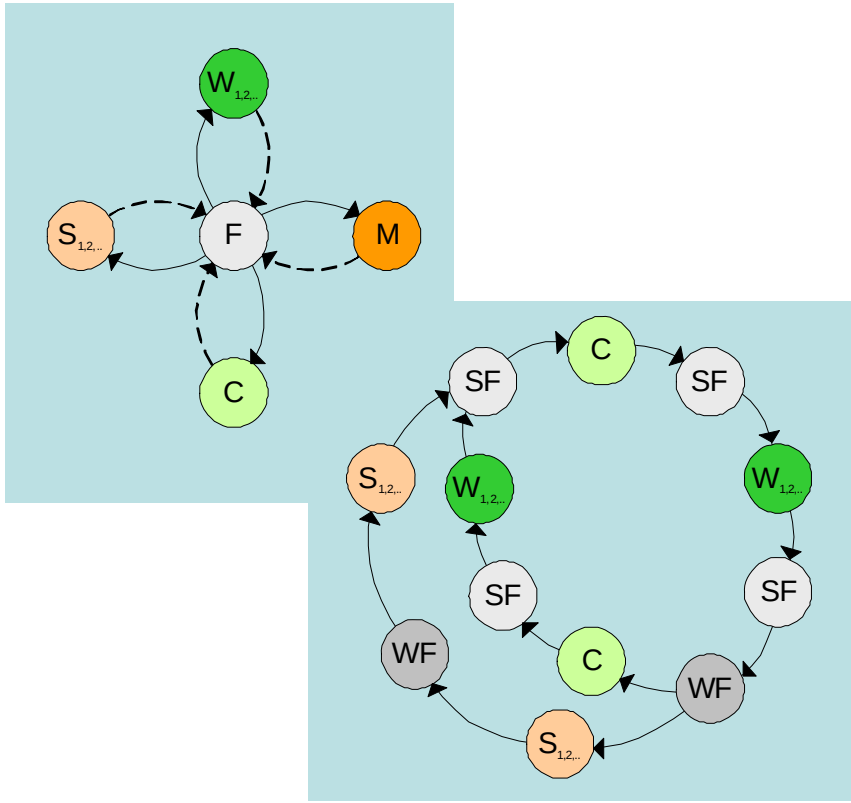
Climate variability → Dynamic (responsive) management.



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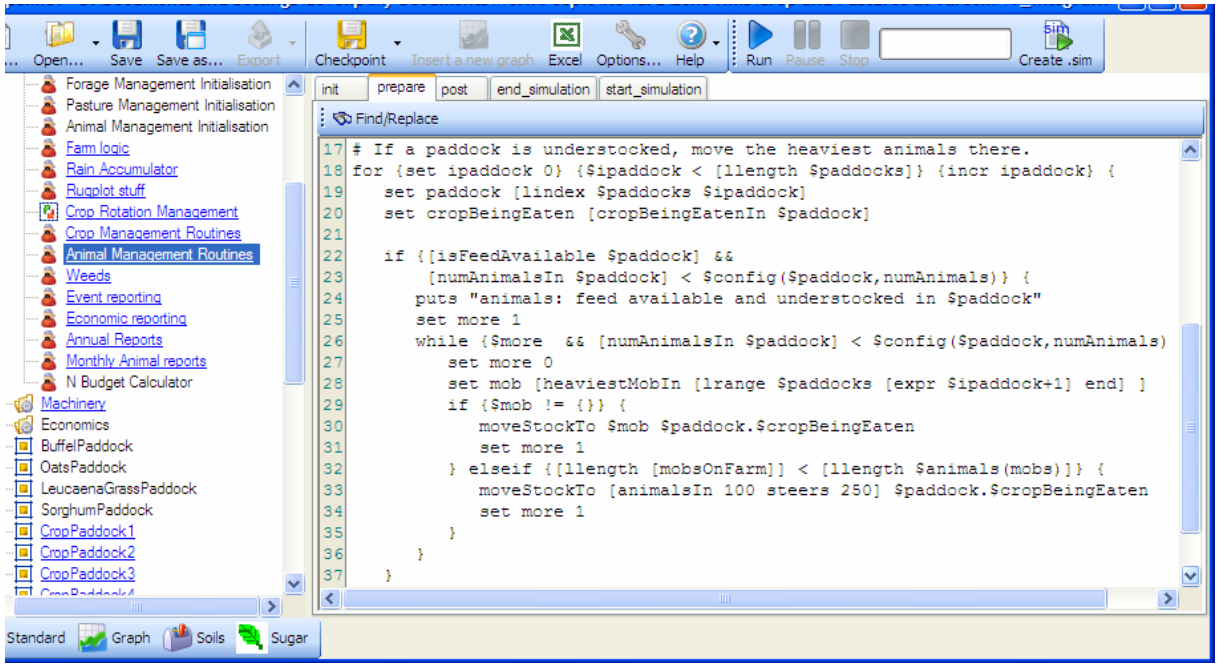
Dynamic (responsive) management:



www.tcl.tk

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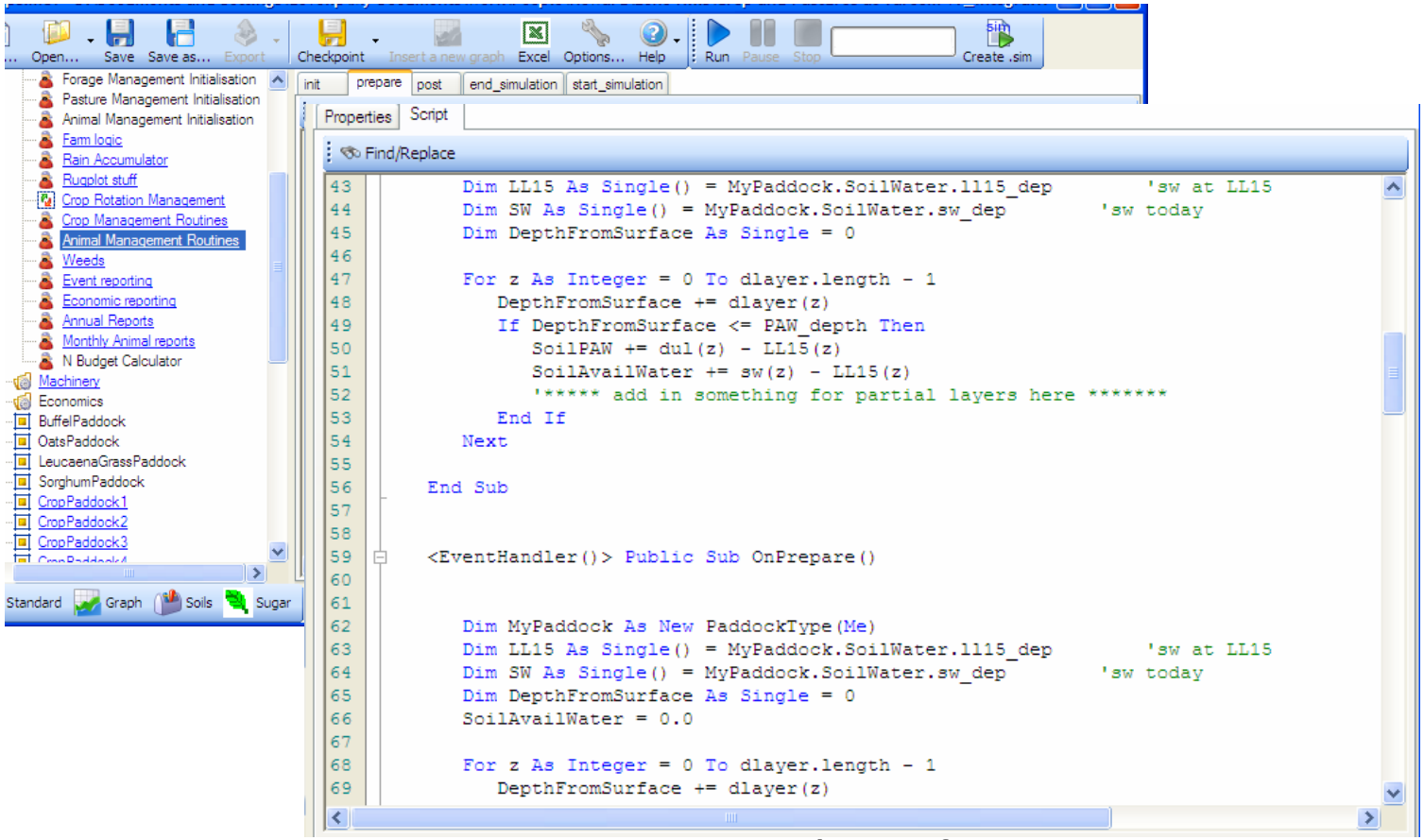
Dynamic (responsive) management:



www.microsoft.com

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Software Architecture

- Component based design based around 4 simple entry points (get, set, publish, subscribe)
- Separation of functionality (via components) essential for re-use
- Modern byte-compiled languages support rapid prototyping of new components in the existing systems framework

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Case studies

- Participatory approach to describe change and adaptation to change

1. “What do you do”
2. What would change “what you do”
3. What adaptations are possible in “what you do”

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Case 1: Mixed grain & graze in Southern Queensland

- 4000ha farm
- 5 cropping fields 220ha = 1100ha
- Buffel (pasture) fields = 2000ha
- Leucaena/grass = 400ha
- Oats = 400ha
- Forage sorghum = 100ha
- 1 Forage legume in cropping rotation

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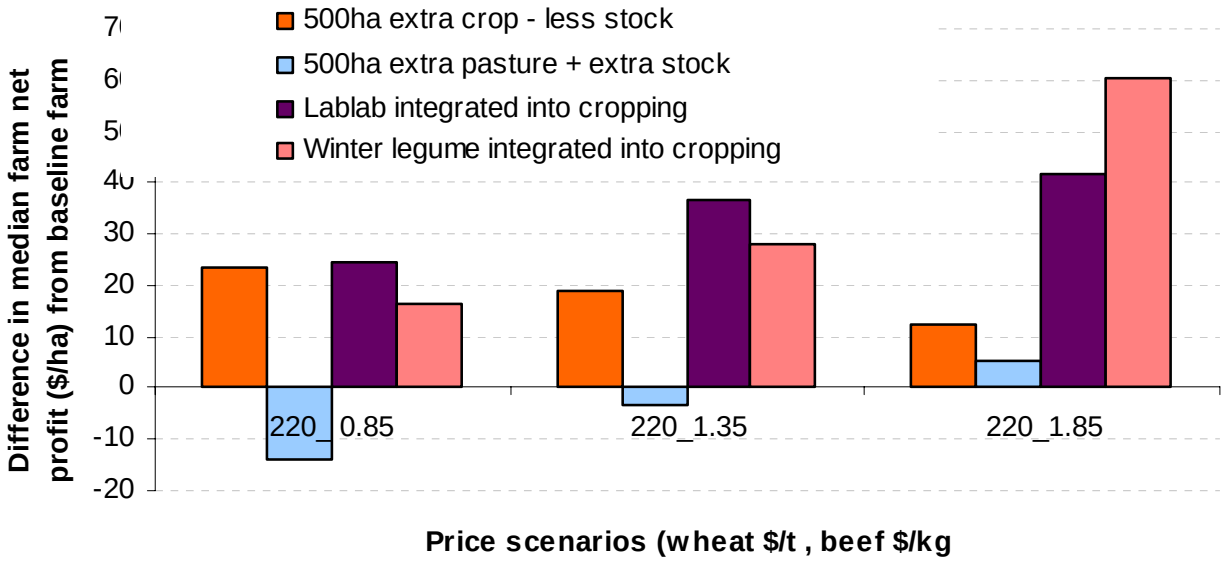
Case 1: Mixed grain & graze in Southern Queensland

"…What adaptations are possible"

- Large change in proportion of crop and pasture
- Integrating summer legume into cropping area
- Integrating winter legume into cropping area



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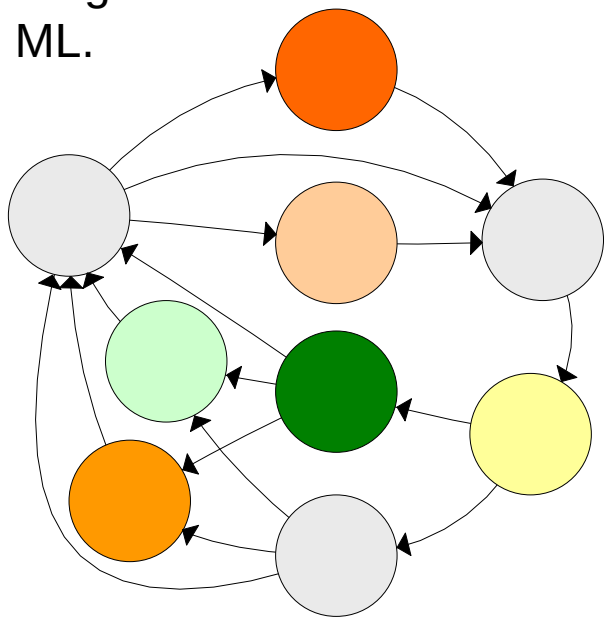
Case 2: Irrigated cotton & grain

- ~800 ha cropping area
- 3 storages with combined capacity of 1350ML
- 600ML annual bore allocation
- Captured overland flow ranges between 0 – 1450 ML.



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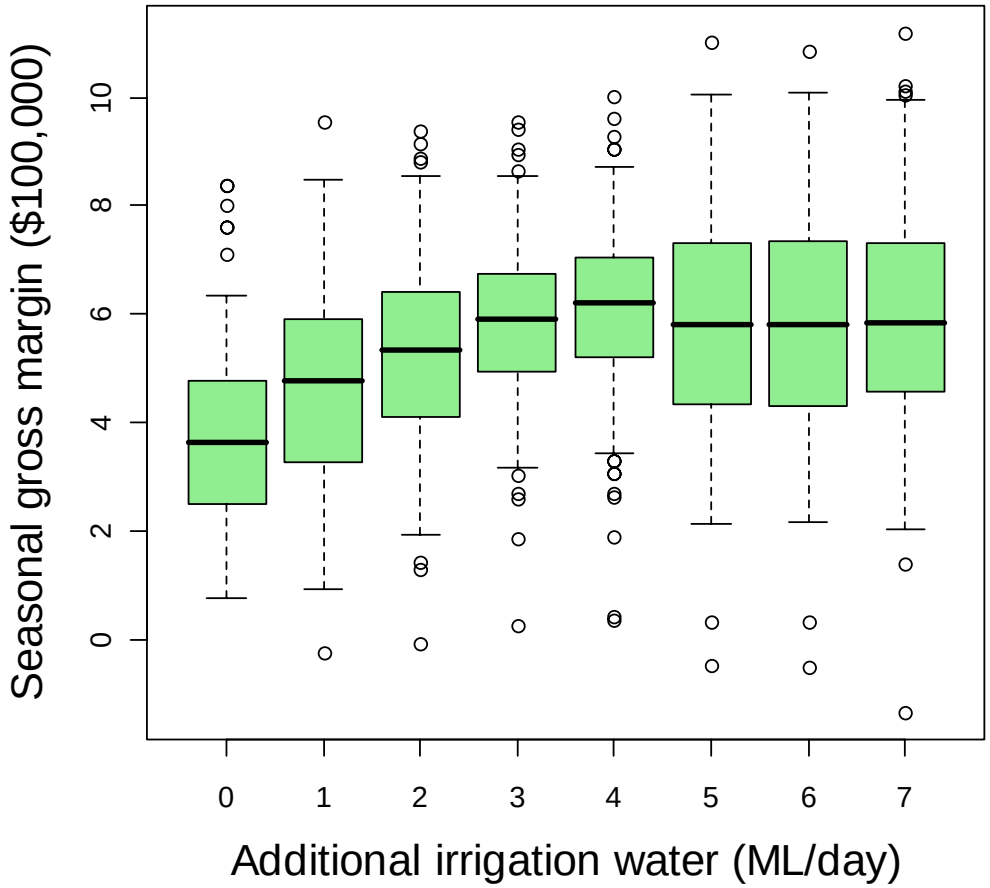
Case 2: Irrigated cotton & grain

What is the additional income from reverse osmosis treated water (a coal seam gas extraction byproduct).

Farm profitability increases until system capacity is reached at 4 ML/day

Whole farm gm increases by approx. $60 000 /(ML*day) (ie $164/ML) up to 4ML/day



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Case 2: Irrigated cotton

"…What adaptations are possible"

- What will be the likely impact of reduced bore allocations on long term profitability?

- Compare the profitability of a cotton monoculture with a cotton and maize and/or sorghum and/or soybeans and/or wheat rotation.

- Compare storing "out of season" water for use on cotton (high losses due to evaporation and seepage) against using the water immediately on a current (non-cotton) crop

In Summary

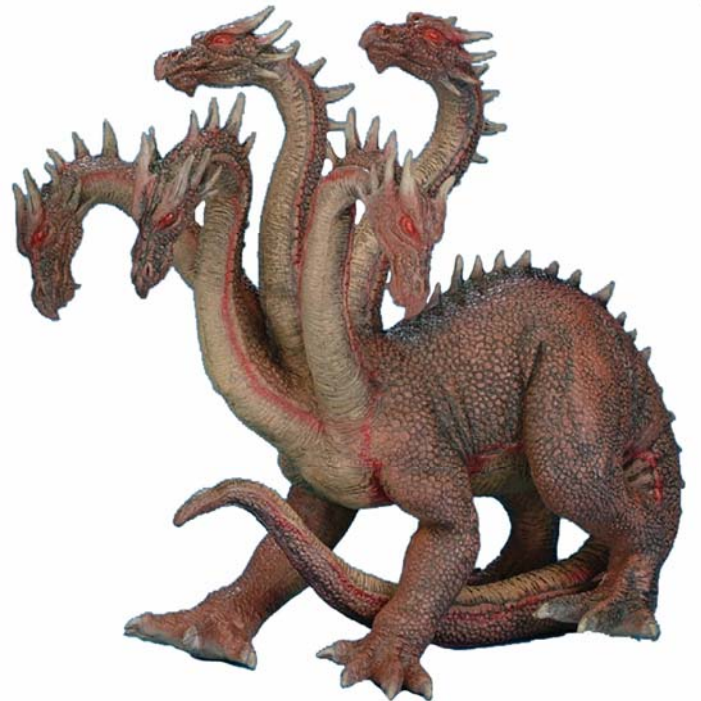
- APSIM model framework has been successfully applied to several WFM problems
- Each time is easier than the last
- Participatory nature of these adaptation case studies produces diverse study areas – interdisciplinary approach is unavoidable.

www.apsim.info

APSIM - Functional issues

- 2 broad areas: development and maintenance
- New developments overseen by a reference panel composed of science and software specialists
- Maintenance the task of SEG:
- Regular ~~indoctrination sessions~~ training workshops
- Continuous integration cycle
- Regular “point” releases

- WWW (ie accessible) tools for
source code,
data repositories,
tracking bugs,
helpdesk and user groups



Models and frameworks

- Why reuse or share models? To avoid hard work!
- Adaptation is easier than starting over

How:

- Keep it simple – your conceptualisation, and your tools

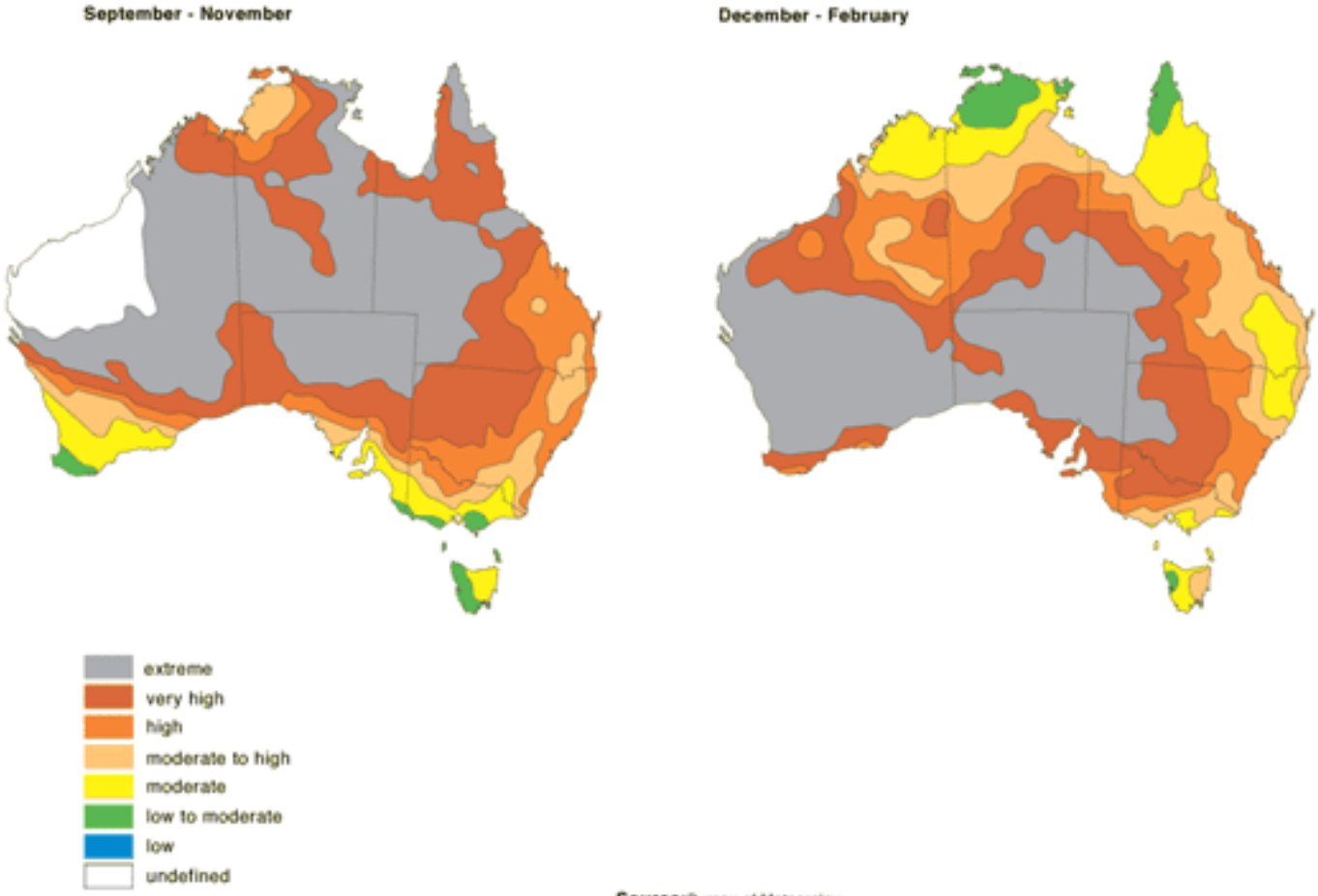
- Adaptive means reuse – and the framework changes too

Open Source

- Openness begins with open source
- Scientific legitimacy – no more “black boxes”
- Wish to form genuine, 2-way relationships

- Earlier experiences are confidence building on our part as well
- Rigorous control ➔ openness

Figure 1.9 Variability of Australian rainfall, for September-November (spring), December-February (summer),March-May (autumn) and June-August (winter)



Source: Bureau of Meteorolgy

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Case 2: Irrigated cotton